

THE MARINE ISOPOD *NEOCIROLANA* HALE, 1925 (CRUSTACEA: CIROLANIDAE)
FROM TROPICAL AUSTRALIAN WATERS

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Bruce, N.L. 1994 12 01: The marine isopod *Neocirolana* Hale, 1925 (Crustacea: Cirolanidae) from tropical Australian waters. *Memoirs of the Queensland Museum* 37(1): 41-51. Brisbane. ISSN 0079-8835.

Two new species of *Neocirolana* are described from sub-littoral tropical waters of northern Australia: *Neocirolana salebra* sp. nov., from the Arafura Sea and *Neocirolana tricistata* sp. nov. from the vicinity of Torres Strait; new localities are also recorded for *Neocirolana hermitensis* (Boone, 1918) and *N. excisa* (Richardson, 1910). Observations indicate that *Neocirolana hermitensis* is a brood predator of hermit crabs. Comments are given on the current status of the genus, together with a list of all species and a key to the Indo-Pacific species. □ *Isopoda, Cirolanidae, new species, northern Australia, taxonomy.*

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Neocirolana Hale, 1925 was established as a monotypic genus, later being revised by Bruce (1981, 1986). Since then Javed & Yasmeen (1990) placed a further two species in the genus, transferring *Neocirolana obtuncata* (Richardson, 1901) from *Cirolana* Leach, 1818, and describing the species *Neocirolana arabica* Javed & Yasmeen, 1990; *Neocirolana tayronae* Müller, 1993 was described from Colombia. In Australia the genus is represented by seven species, including the two new species described here, six of which occur only within the tropics.

METHODS

Methods follow those outlined in Bruce (1986, 1993).

ABBREVIATIONS

BRR- Bureau of Rural Resources; CP- circumplumose; CP- circumplumose setae; NT- Northern Territory; Northern Territory Museum, Darwin, N.T.; PMS- plumose marginal setae; Qld- Queensland, Australia; QM- Queensland Museum, Brisbane; USNM- National Museum of Natural History, Smithsonian Institution, Washington, D.C.; WA- Western Australia.

TAXONOMY

Family CIROLANIDAE Dana, 1852

Neocirolana Hale, 1925

Neocirolana Hale, 1925: 153; Holdich et al., 1981: 583; Bruce, 1981: 955, fig. 6g, h; 1986: 200; Javed & Yasmeen, 1990: 71.

TYPE SPECIES

Neocirolana obesa Hale, 1925, by monotypy.

DIAGNOSIS

Head narrow, 50 - 60% width of pereonite 1. Pleon with 5 unfused segments; posterolateral margins of pleonite 4 encompassing and extending posteriorly beyond posterior of pleonite 5. Frontal lamina ventral surface flat. Mandible incisor narrow, usually less than 50% of maximal mandible width; spine row usually with 3 - 7 spines, molar usually reduced in size (in comparison to *Cirolana*), weakly toothed. Maxillule entire, or with reduced spination. Maxilla entire or often with reduced setation and reduction in size of lobes. Pereopods robust, ambulatory, not markedly flattened or expanded; pereopods 1-3 with anterodistal angles of ischium and merus not produced or lobate. Pleopods with PMS on all rami except endopod of pleopod 5; peduncles without lateral lobes; appendix masculina basally inserted.

Additional characters. Body 2-3 times as long as wide; pereonite 1 distinctly longer than pereonite 2; posterolateral margins of pleonite 3 often extending to or beyond posterior of pleonite 5. Antennule peduncle with 3 major articles, article 4 minute; articles 1 and 2 subequal in length, partly or wholly fused. Mandible without lacinia mobilis. Maxilliped entire, or with various setal reductions, sometimes with endite reduced. Antennal peduncle 5 articulated. Mandible palp 3 articulated, extending beyond incisor. Pereopod dactylus with distinct secondary unguis. Penes short papillose or vasa deferentia

opening flush with surface of sternite 7. Uropod peduncle inner margin produced along endopod medial margin; rami provided with PMS interspersed with spines.

REMARKS

Species of *Neocirolana* all have at least some reduction of the mouthpart appendages; most species (7 of 9) have a narrow mandibular incisor, often (7 of 9) accompanied by a reduced spine row of less than 5 spines and a molar process that is smaller than that of *Cirolana*; the narrow mandible incisor appears to be associated with a narrower head width. Modifications also occur in the other mouthpart appendages, but these are mostly restricted to single species, and where similar may not be homologous. *Neocirolana excisa*, *N. maculata* and *N. obesa* all share a similar mouthpart, pereopod and uropod morphology, and appear to form a group of related species, as indicated by Bruce (1986). *Neocirolana arabica* differs from *Cirolana* only in having few (3) spines on the mandibular spine row, and could arguably be better placed in *Cirolana*. Similarly, *Neocirolana salebra*, while very similar to *Cirolana* with regard to most generic characters, differs substantially in the spination of the maxillule. In contrast, all the mouthparts of *N. obtruncata* are reduced or otherwise modified.

Two species, *N. bicrista* and *N. tricristata*, have longitudinal ridges on the pleotelson, and also have similar mouthparts, but the pereopodal morphology of the two species is distinct.

The conclusion drawn by Javed & Yasmeen (1990) that *Neocirolana* is a paraphyletic taxon for which the principal uniting character is a homoplasy is further supported by the two new species described here. The species currently placed in the genus are better retained in their present combinations, as other existing genera are less appropriate.

SPECIES OF *NEOCIROLANA*

Neocirolana arabica Javed & Yasmeen, 1990. Karachi coast of Pakistan, northern Indian Ocean. Types held at the QM. The species is otherwise very similar to those species of *Cirolana* which have a nodulose pleon and pleotelson, and uropods with dense setal development in the males, such as *Cirolana pleonastica* Stebbing, 1900.

Neocirolana bicrista Holdich et al., 1981. Known only from shallow subtidal depths,

Halifax Bay, Townsville, Queensland. Types held at the QM.

Neocirolana excisa (Richardson, 1910). Type locality Cabalian Point, Jolo, Phillipines; common in tropical Australian waters. Syntypes held at the USNM.

Neocirolana hermitensis (Boone, 1918). An associate of hermit crabs, probably a brood predator (see species 'Remarks' given here for that species). Common in tropical Australian waters. Location of the type material is unknown.

Neocirolana maculata Bruce, 1986. Known only from the original records, Wistari Reef, Capricorn Group, southern Great Barrier Reef and Marion Reef, Australian Coral Sea. Types held at the QM.

Neocirolana obesa Hale, 1925. Type species. Types held at the Australian Museum, Sydney. Recorded distribution in southeastern Australia from Moreton Bay, southeastern Queensland to the Sydney region of New South Wales

Neocirolana obtruncata (Richardson, 1901). Jamaica and Caribbean coast of Mexico (Martin & Felder, 1984). Types held at the USNM.

Neocirolana salebra sp. nov. Described herein.

Neocirolana tayronae Müller, 1993. Caribbean coast of Colombia, in shallow water. Holotype held at the Zoologisches Museum, Berlin.

Neocirolana tricristata sp. nov. Described herein.

KEY TO THE INDO-WEST PACIFIC *NEOCIROLANA*

1. Dorsal surfaces nodulose 2
Dorsal surfaces smooth, without nodules . . . 5
2. Pereon, pleon and pleotelson with distinct nodules . 3
Pereon and pleon without distinct nodules,
pleotelson with distinct longitudinal carinae . 4
3. Pereonites 7 only with nodules, pleon and pleotelson with fine nodules and pleonites 3-5 with larger paired nodules; male uropod rami lateral margin with dense mass of setae . . . *N. arabica*
Pereonites 5-7, pleon and pleotelson heavily nodulose; male uropod rami without setal mass *N. salebra* sp. nov.
4. Pleotelson with 2 widely spaced carinae and weak median carina; pereopod dactylus slender with minute secondary unguis *N. bicrista*
Pleotelson with 3 closely spaced carinae; pereopod dactylus robust with prominent secondary unguis *N. tricristata* sp. nov.
5. Uropod lateral margin without excision, apices not bifid; maxilliped endite reduced, without CPS or coupling hooks *N. hermitensis*

- Uropod lateral margin with excision, apices bifid; maxilliped endite with CPS and 2 coupling hooks 6
6. Uropod endopod deeply excised; maxilla middle and lateral lobes expanded *N. excisa*
Uropod endopod shallowly excised; maxilla middle and lateral lobes not expanded 7
7. Cephalon anterior margin without distinct rostral point; antennular flagellum half as long as peduncle *N. obesa*
Cephalon anterior margin with rostral point; antennular flagellum longer than peduncle *N. maculata*

Neocirolana salebra sp. nov.

(Figs 1, 2)

MATERIAL EXAMINED

HOLOTYPE: ♂ (9.7 mm), Northern Territory, Arafura Sea, 11°13.5'S, 129°42'E, 12 Dec 1989, dredged 23.8m, BRR.QMW18711.

DESCRIPTION

Male holotype. Body about 2.7 times as long as greatest width; maximum width at pereonites 4-6, margins sub-parallel. Cephalon without rostral point in dorsal view; with submarginal anterior suture, with obscure ridge along medial margin of eyes; eyes large, occupying 50% width of cephalon in dorsal view; ocelli distinct. Pereonites 1-7 each with transverse suture, pereonites 4-7 becoming increasingly nodulose; coxae 2-7 not prominent in dorsal view, all with prominent entire oblique carina; posterolateral angles of coxae 5-7 acute. Pleonites all visible; pleonite 1 smooth; pleonites 2-5 nodulose, with median nodules most prominent on pleonites 3-5. Pleotelson nodulose, median nodules most prominent.

Antennule peduncle 2.8 times as long as width at article 2, articles 1 and 2 wholly fused, article 3 slightly shorter than combined lengths of articles 1 and 2; flagellum short, extending to anterior of pereonite 1, with 9 articles bearing abundant aesthetascs. Antenna peduncle articles 1 and 3 short, articles 4 and 5 subequal in length; flagellum with 14 articles, extending to posterior of pereonite 2.

Frontal lamina pentagonal, about twice as long as wide, with 2 submedian grooves. Mandible incisor with cusps indistinct, nearly as wide as maximal width; spine row with 13 spines; molar process with setules, anterior margin with 11 widely spaced spines; palp articles 2 and 3 with 13 and 14 serrate spines respectively. Maxillule lateral lobe with 11 slender spines on gnathal surface, some of which are nodulose; medial lobe with 3 very slender spines. Maxilla lateral and

middle lobe each with 3 setae; medial lobe with 2 CP spines and 9 simple setae. Maxilliped palp medial margins of articles 2-5 provided with short serrate spines, lateral margins with few setae; endite with 2 coupling hooks, 3 short simple setae and 4 long CPS.

Pereopods with few setae. Pereopod 1 merus posterior margin laterally with 6 blunt tubercular spines; 1 short acute spine, medially with 5 acute spines; posterior margin of carpus with 1 acute spine; propodus with 3 acute spines, distal spine opposing dactylus base 20% length of dactylus. Pereopod 2 posterodistal margin of ischium with 1 tubercular and 1 large blunt spine; posterior margin of merus with 3 short tubercular, 2 longer stout blunt spines, and 3 acute spines; carpus with 2 acute and 1 blunt spines at posterodistal angle; propodus palm with 3 acute spines. Pereopod 7 with anterodistal angles of ischium, merus and carpus each with cluster of large spines, some of which are serrate; posterior margins of ischium, merus and carpus with short and stout spines and cluster of spines at distal angle.

Pleopod 1 with both rami distally rounded, endopod with ~13 PMS, about 0.3 times as wide as exopod, exopod with ~40 PMS and spine at proximolateral margin. Pleopod 2 exopod and endopod with ~50 and 15 PMS respectively, appendix masculina straight with apex abruptly narrowed, extending very slightly beyond distal margin of ramus. Pleopods 3-5 exopods with the distal margin distinctly indented, with transverse suture and with about 50 PMS; endopods each with ~12, 10 and 0 PMS respectively. Uropod exopod about 0.8 times as long as endopod, straight, about 2.5 times as long as proximal width, with 2 prominent lateral submarginal nodules, lateral margin sinuate with 5 acute spines set among prominent PMS, medial margin with 4 spines among PMS, apex subequally bifid; endopod lateral margin indented at distal two-thirds of length, with prominent subapical nodule, with PMS and 1 spine adjacent to apex, medial margin smoothly convex, with 7 stout peg-like spines set among PMS; apex sub-bifid with lateral process prominent.

REMARKS

The nodulose pereon and pleon immediately distinguishes *Neocirolana salebra* from all other species in the genus. *N. arabica* has a nodulose pleon and pleotelson, but the nodules are fine except for the pairs of prominent submedian nodules on pleonites 3 and 4. There are numerous

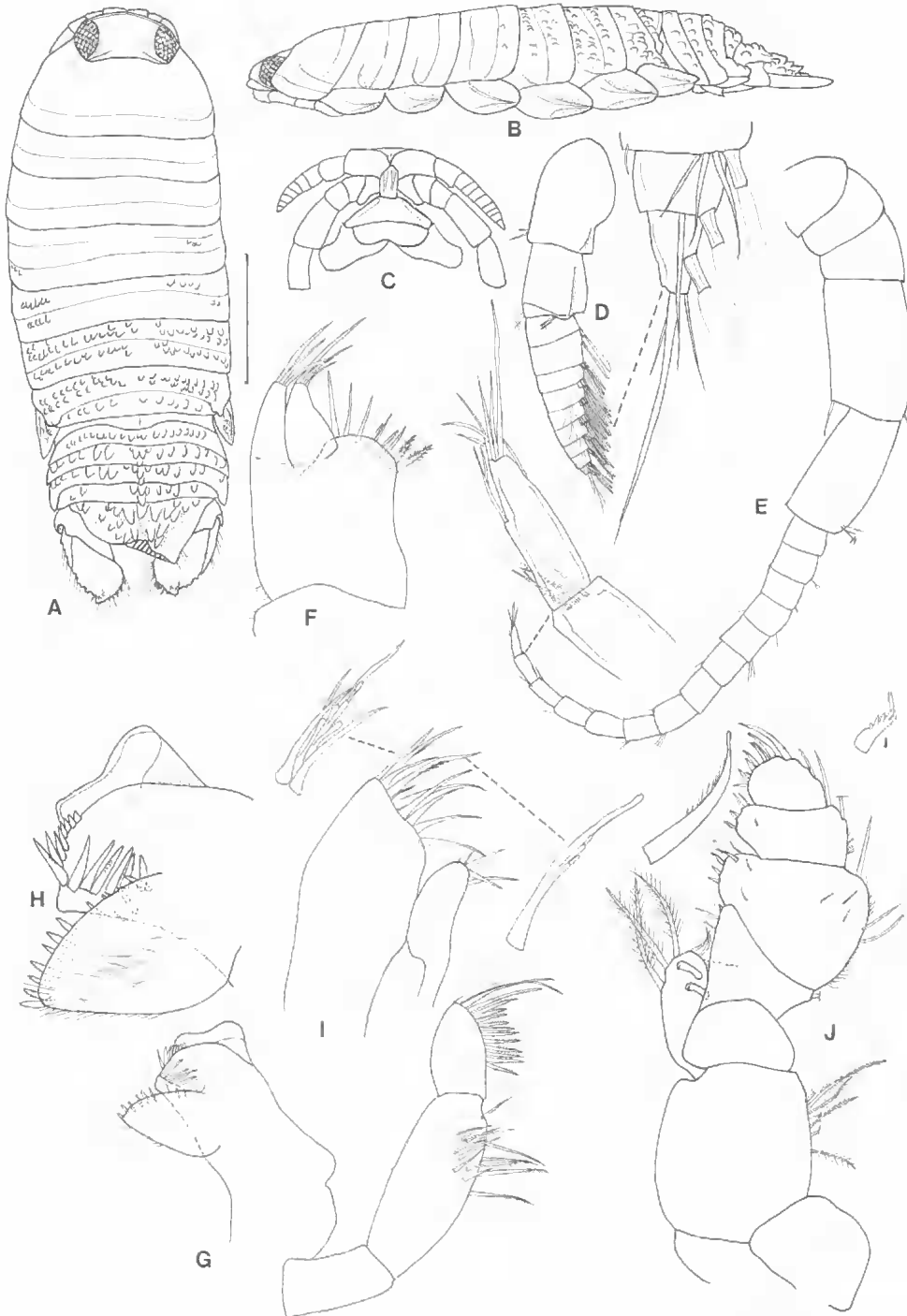


FIG. 1. *Neocirolana salebra* sp. nov. A, dorsal view; B, lateral view; C, frons; D, antennule, and detail of terminal flagellar articles; E, antenna, and detail of flagellar articles; F, maxilla; G, mandible; H, mandible, detail of incisor, molar and spine row; I, maxillule; J, maxilliped. j spine from medial margin of palp article 5. Scale = 2.0mm.

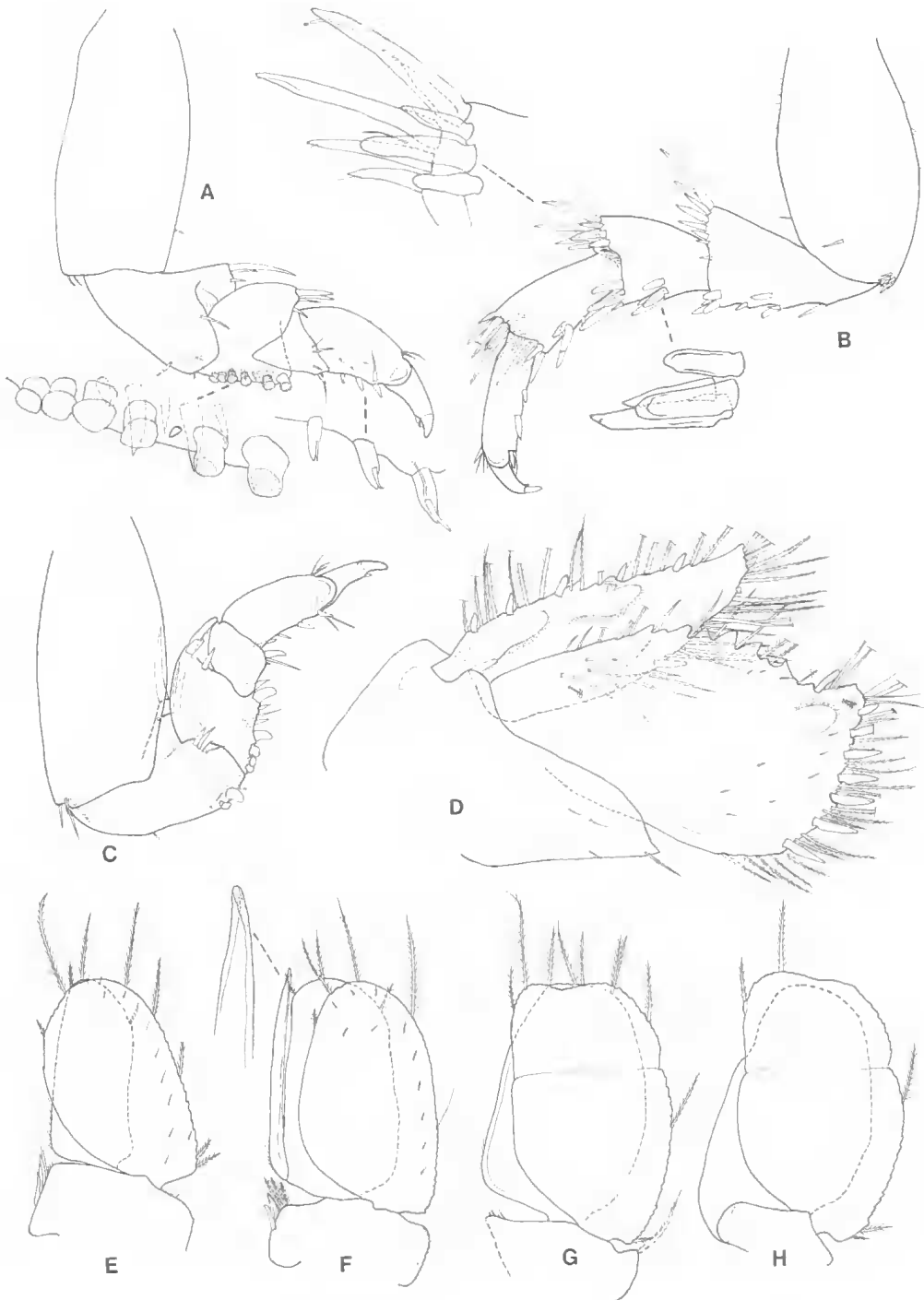


FIG. 2. *Neocirolana salebra* sp. nov. A, pereopod 1; B, pereopod 7; C, pereopod 2; D, uropod; E-H, pleopods 1-3, 5 respectively.

other differences between these two species, including the ornamentation of the frontal lamina, setation of the uropods and morphology of the mouthparts, those of *N. arabica* scarcely differing from *Cirolana*, while the mandible, maxillule and maxilliped of *N. salebra* differ significantly from that of *Cirolana*.

ETYMOLOGY

From the Latin *salebra* = rugged, uneven, alluding to the nodulose dorsal surfaces.

Neocirolana tricristata sp. nov. (Figs 3-5)

MATERIAL EXAMINED

HOLOTYPE: ♂ (3.4 mm), Gulf of Carpentaria, Queensland, 10°58.5'S, 141°12'E, 3 Dec 1990, dredged 31.0m, S. Cook on FRV *Southern Surveyor*, QMW18717.

DESCRIPTION

Male holotype. Body about 2.2 times as long as greatest width; maximum width at pereonites 3-6, margins sub-parallel. Cephalon without rostral point in dorsal view; anterior margin thickened, with submarginal anterior suture, with obscure longitudinal ridge along medial margin of eyes; eyes occupying 44% width of cephalon in dorsal view; ocelli distinct. Pereonites 1-7 each with transverse suture, becoming laterally more prominent on pereonites 5-7; coxae 2-5 not prominent in dorsal view, all coxae with prominent entire oblique carina; posterolateral angles of coxae 5-7 acute. Pleonites all visible, pleonites 2-5 with finely nodulose posterior margin. Pleotelson with submarginal nodule at anterolateral angle; lateral margins obscurely thickened; dorsal surface with 3 distinct longitudinal ridges consisting of median ridge flanked by further ridge on either side; posterior margin evenly rounded, with 4 spines set among PMS.

Antennule peduncle robust, 2.5 times as long as width at article 2, articles 1 and 2 partially fused, article 3 about half as long as the combined lengths of articles 1 and 2; flagellum short, extending to anterior of pereonite 2, with 9 articles bearing conspicuous spray of aesthetascs. Antenna peduncle dorsoventrally compressed, article 1-3 short, articles 4 longest, 1.4 times longer than article 5; flagellum with about 9 articles, extending to posterior of pereonite 2.

Frontal lamina pentagonal, about twice as long as wide, lateral margins weakly concave, with 2 submedian grooves. Mandible incisor narrow,

about 50% maximal width, with distinct cusps; spine row with several setae and 3 spines; molar process short, with few setules, anterior margin with about 7 widely spaced spines; palp articles 2 and 3 with about 10 and 7 serrate spines respectively. Maxillule lateral lobe with 12 slender spines on gnathal surface, several of which serrate; medial lobe with 2 CP spines. Maxilla lateral and middle lobe with 3 and 4 setae respectively; medial lobe with 5 CP spines and 3 simple setae. Maxilliped palp articles lateral margins with few setae; endite with 1 coupling hooks, 3 short CPS.

Pereopods robust, with few setae. Pereopod 1 merus posterior margin with 3 blunt tubercular spines and 1 acute spine; posterior margin of carpus with 1 acute spine; propodus with 1 acute spine, and distal spine opposing dactylus base 38% length of dactylus. Pereopod 2 posterodistal margin of ischium with 1 tubercular spine; posterior margin of merus with 3 tubercular and 2 long acute spines; carpus with 2 acute spines at posterodistal angle; propodus palm with 1 acute spine. Pereopod 7 with anterodistal angles of ischium, merus and carpus each with cluster of large spines, some of which are serrate; posterior margins with short simple acute spines at distal angles, ischium with 3 short acute spines along posterior margin, merus, carpus and propodus with 1 each.

Pleopod 1 with both rami distally rounded, endopod about 3 times as long as wide, about 0.5 as wide as exopod; exopod with ~20 PMS and spine at proximolateral margin, endopod with ~10 PMS. Pleopod 2 exopod and endopod with ~26 and 9 PMS respectively, appendix masculina distally curving slightly towards lateral margin, apex extending beyond distal margin of ramus by half of its length. Pleopods 3-5 with similar, exopods each with the distal margin rounded, each with transverse suture and with about 25 PMS; endopods each with ~10, 6 and 0 PMS respectively. Uropod exopod about 0.9 times as long as endopod, straight, about 3 times as long as proximal width, lateral margin straight, irregularly notched with 4 short spines, each set in notch, and 7 PMS, medial margin with 2 spines among PMS, apex subequally bifid with cluster of setae and small spine within apical notch; endopod lateral margin indented with 4 PMS and 1 spine adjacent to apex, medial margin serrate, smoothly convex, with 3 stout peg-like spines set among PMS; apex subequally bifid with cluster of setae and two small spines within apical notch.

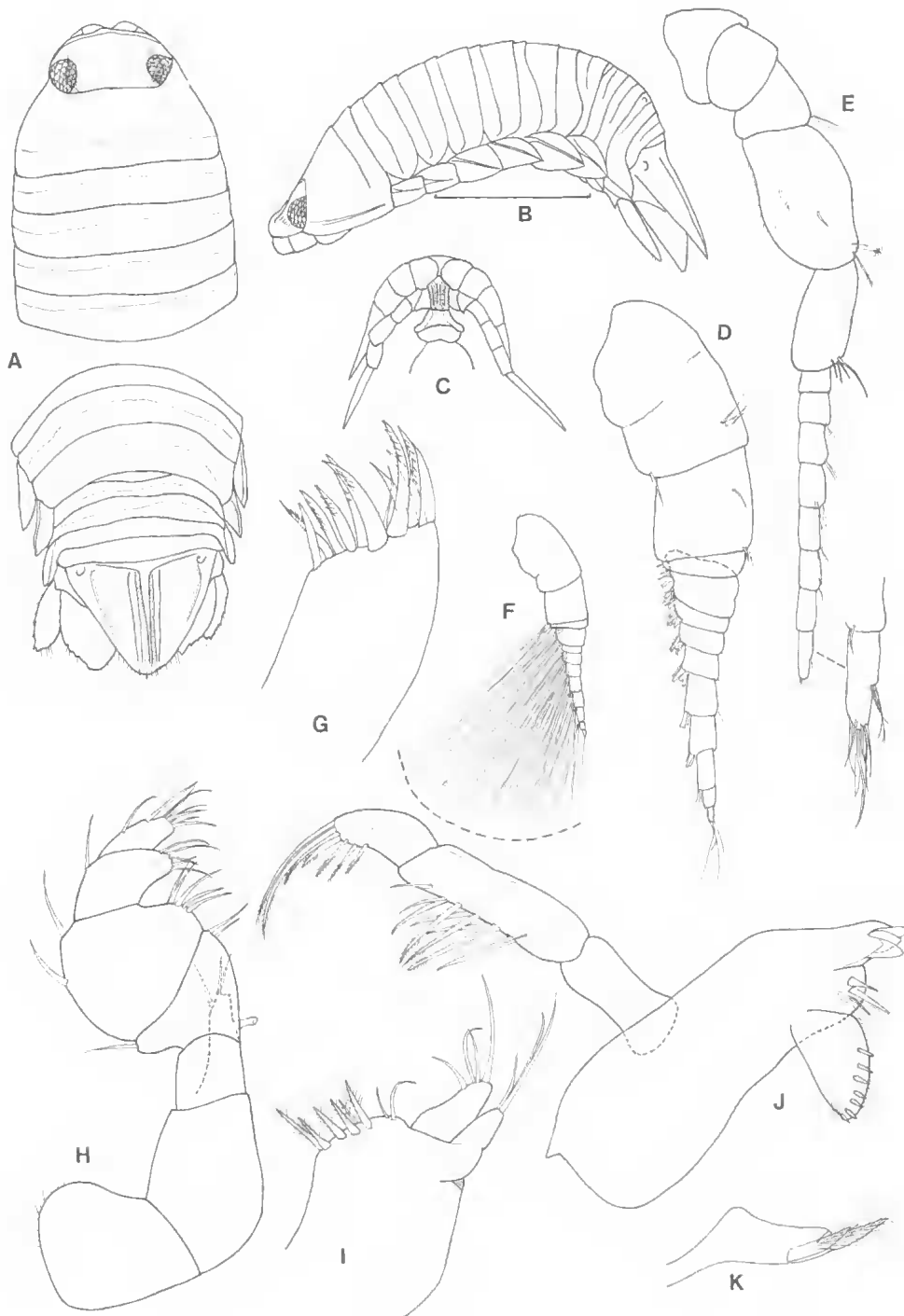


FIG. 3. *Neocirolana tricristata* sp. nov. A, dorsal view; B lateral view; C, frons; D, antennule; E, antenna; F, antennule, showing spread of aesthetascs; G, maxillule, lateral lobe; H, maxilliped; I, maxilla; J, mandible; K, maxillule, medial lobe in oblique view. Scale = 1.0mm.

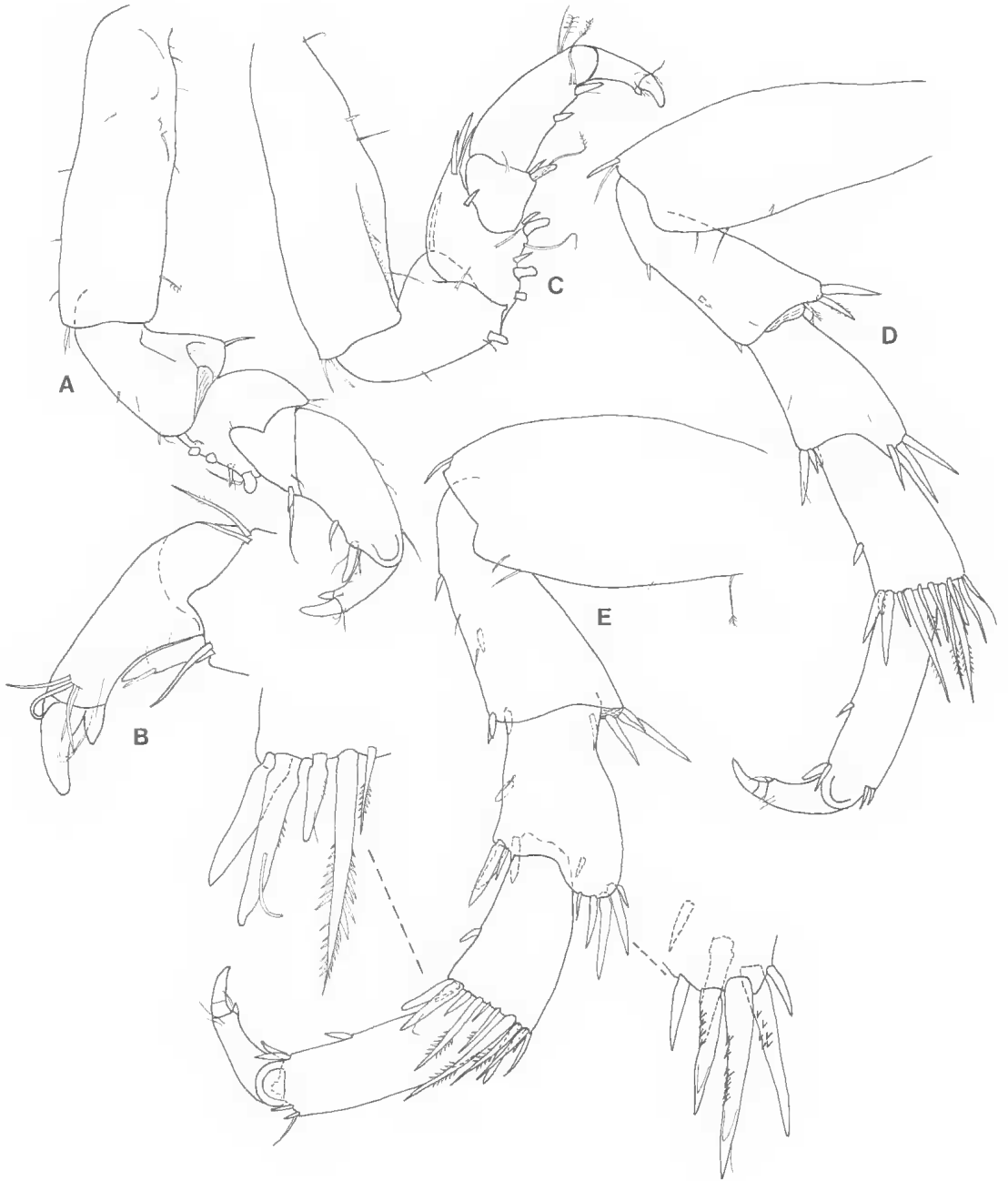


FIG. 4. *Neocirolana tricristata* sp. nov. A, pereopod 1; B, pereopod 1, dactylus, medial view; C, pereopod 2; D, pereopod 6; E, pereopod 7.

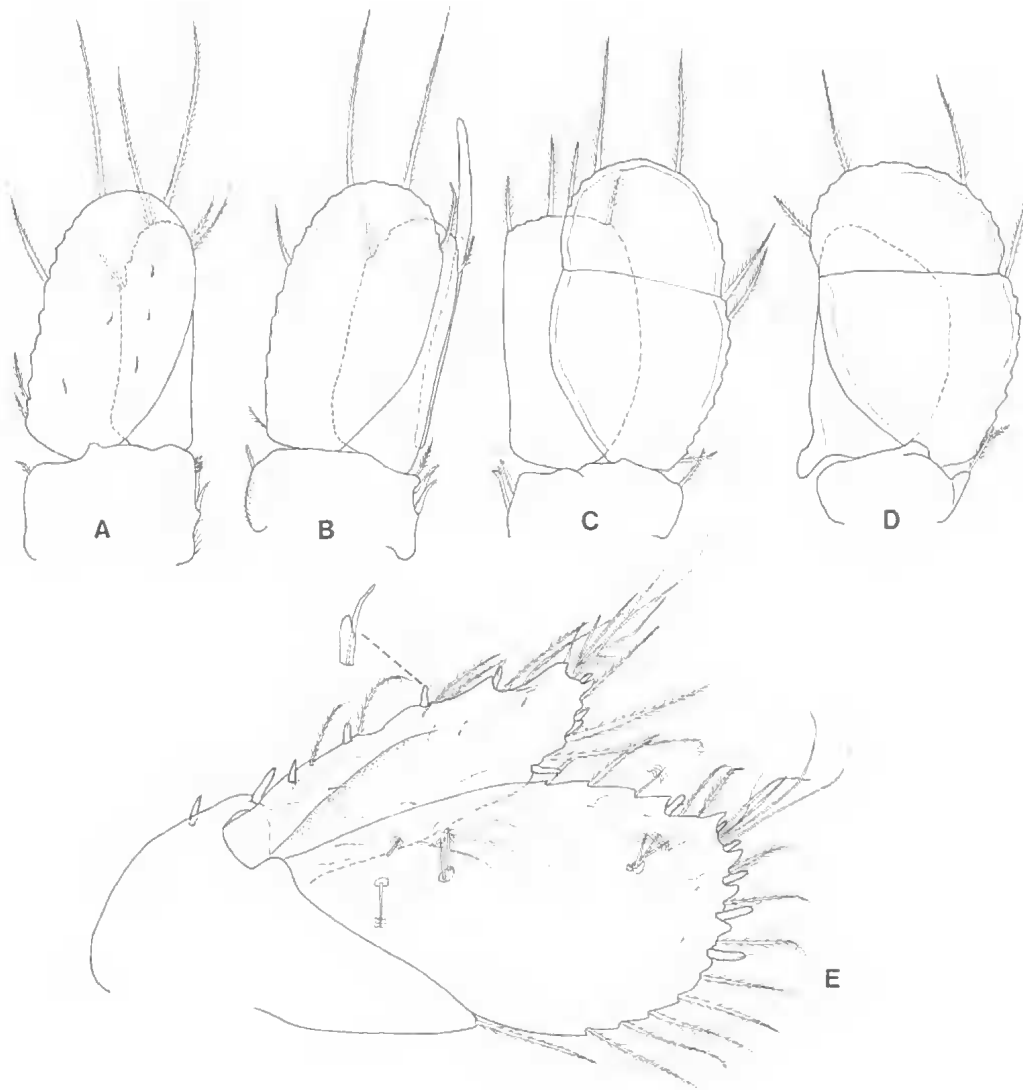


FIG. 5. *Neocirolana tricristata* sp. nov. A-D, pleopods 1-3, 5 respectively; E, uropod.

REMARKS

This species is readily separated from others of the genus by the three prominent pleotelsonic ridges and the antennular morphology. *Neocirolana bicrista* has two ridges on the pleotelson and a third weakly defined median ridge. *N. tricristata* has a maxilla and maxilliped that are similar to that of *Cirolana*, the maxilliped having the mediodistal angles of palp articles 2 - 4 somewhat produced and lobate, and provided with abundant slender

setae. In contrast, in *N. bicrista* the maxilla has no large circumplumose setae on the medial lobe and has prominent recurved setae on the middle and lateral lobes; the maxilliped has cuticular setules along both margins of the palp, but few setae, and the mediodistal angles are scarcely produced and have only 1 or 2 short setae. The pereopods of *N. tricristata* differ from that of *N. bicrista* being more robust and in having a prominent spine opposing the dactylus base and a prominent secondary un-

guis to the dactylus, both of these being minute in *N. bicrista*.

The antennule flagellum has a dense mass of aesthetascs, and is similar in form to a calynophore (Lowry, 1986). The definition of a calynophore includes the total or partial fusion of the proximal articles (Lowry, 1986), and as the articles of *N. tricristata* are unmodified in that way, nor are they particularly enlarged, the aesthetasc mass is not regarded as a calynophore.

ETYMOLOGY

From the Latin *crista* = ridge, alluding to the three pleotelsonic ridges.

Neocirolana excisa (Richardson, 1910)

Cirolana excisa Richardson, 1910: 6, figs 4, 5; Nierstrasz, 1931: 156; Bruce, 1980: 127, 128.

Neocirolana excisa; Bruce, 1981: 957; 1986: 207, figs 144, 145; Javed & Yasmeen, 1990: 72, table 1.

MATERIAL EXAMINED

ARAFURA SEA: ♀, non-ovig, 10°32.6'S, 134°16.6'E, 13 Oct 1992, 60m, R.W. Williams, NTMCR009778; ♂, 11°18.3'S, 129°24.0'E, 21 Nov 1989, 34.7m, BRR, QMW18710; ♀, 11°00.0'S, 132°47.0'E, 30 Oct 1989, 18.3m, BRR, QMW18712. NORTHERN TERRITORY: ♂, Channel Is, Darwin, 20 Aug 1982, ex sponge 'A', 11m, P. Horner, NTMCR005822; 3 ♀, 2 ovig, 1 non-ovig, Coral Bay, Port Essington, Coburg Peninsula, 11 Aug 1986, ex sponge, R. Williams, NTMCR004142; ♀, non-ovig, north of Wessel Island, 16°32.5'S, 121°24.5'E, 17 Apr 1983, 40m, W. Houston, NTMCR002976. GULF OF CARPENTARIA: 2 ♂, far northern Gulf, Qld, 10°04.1'S, 141°24.4'E, 1 Apr 1989, dredged, 61.0m, BRR, QMW19715.

REMARKS

Previously known from two records only, the species is not uncommon along Australia's northern coasts from the intertidal to a depth of 61m; two records are from sponges. It has not been taken from coral reef habitats and may inhabit only inshore and offshore habitats with a high silt load.

DISTRIBUTION

Originally recorded (Richardson, 1910) from the Philippines, the species is now recorded from Australia's tropical northern waters from the Arafura Sea to Torres Strait at depths from 11 to 61m. It has not been collected from tropical eastern Queensland, despite collecting ef-

forts in that region, and its range may not extend to that area.

Neocirolana hermitensis (Boone, 1918)

Cirolana hermitensis Boone, 1918: 592, pl. 31, fig. 2; Hale, 1925: 132.

Neocirolana hermitensis; Bruce, 1981: 956; 1986: 202, figs 140, 141; Javed & Yasmeen, 1990: 72, table 1.

MATERIAL EXAMINED

TIMOR SEA: ♂, Oxley Island, 10°59.0'S, 132°48.8'E, 19 Oct 1982, low water spring level, ex *Dardanus* sp. A.J. Bruce, NTMCR002282; ♀, ovig, Hibernia Reef, 11°59'S, 123°22'E, 15 May 1992, 0-0.5m, on reef flat in *Turbo* shell with *Calcinus gaimardii*, J. Short, QMW14232; 3 ♂, 2 ♀, ovig, 'Ann Millicent' wreck, Cartier Reef, WA, 12°32.8'S, 123°32.9'E, 4 May 1992, intertidal, in *Bursa granularis* shell, R. Williams & B. Russel, NTMCR009613; ♂, ♀, non-ovig, North West Island, Ashmore Reef, 21 Sept 1987, intertidal, ex *Dardanus*, H. Larson, NTMCR005981. TORRES STRAIT: Juvenile, 10°02'S, 142°31'E, 21 Apr 1974, 13m, Qld Fisheries Service, QMW17960; ♂, 9°56.2'S, 141°55.5'E, 3 Apr 1989, 39m, dredged, BRR, QMW18714; ♂, 10°22.4'S, 141°30.3'E, 4 May 1989, 65m, dredged, BRR, QMW18716.

REMARKS

This species is regularly recorded from gastropod shells that are, or have recently been occupied by hermit crabs prior to collection, usually by species of *Dardanus*. Recently a specimen was collected by J.D. Shields at Bird Islet, Lizard Island in association with a female *Dardanus scutellatus*. The isopod left when the shell was cracked open to remove the crab, and immediately swam to the ovigerous host and was seen to be eating the eggs. The remains of eggs were also observed in its gut. It seems very probable, therefore, that *Neocirolana hermitensis* is an egg predator, a habit which has been recorded only for one species of deep-water lysianassoid amphipod (Bowman & Wasmer, 1984), but not previously for the Cirolanidae, nor any other marine isopod.

DISTRIBUTION

Most records are from offshore coral reef habitats around the Australian coast, with the exception of one record from inshore coral reefs at Port Essington, NT (Bruce, 1986); from the Montebello Islands, WA, to Lizard Island, Qld, Australia.

ACKNOWLEDGEMENTS

I am indebted to Dr Jeffrey D. Shields (Virginia Institute of Marine Science, The College of William & Mary, Virginia, U.S.A.) for providing the information on his observations of the dietary habits of *Neocirolana hermitensis*. I also thank Stephen Cook (QM) for delivery of specimens from the Gulf of Carpentaria, and P.J.F. Davie (QM) and A.J. Bruce (NTM) for the opportunity to examine material under their care. I thank Jørgen Olesen for his inking of the figures.

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